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ABSTRACT

Information Systems research has proposed a range of knowledge elicitation and requirements analysis techniques, few of which apply specific strategies for eliciting implicit knowledge from participants. This paper demonstrates a methodology for eliciting tacit knowledge from the spoken discourse of organisational participants through directed interviews. It argues that Polanyi's (1966:4) widely cited notion that "we know more than we can tell" represents an impoverished model of language that does not acknowledge the implicit component of discourse. An argument is made to characterise tacit knowledge as implicit meaning-making. Our conception of tacit knowledge as implicit meaning-making is aligned with Polanyi's model in the sense that it acknowledges that tacit knowing is a subsidiary process, however we argue that such an implicit process is also present in making meaning with language. We may articulate what we know implicitly through patterns and features of language to which we do not directly attend. Hence analysis of language appears a means for understanding and eliciting tacit knowledge. The present research provides a case-study demonstrating a practical application of such analysis. Our response is to extend Polanyi: "we tell more than we realise we know".

Keywords

Tacit Knowledge, Knowledge Management, Systemic Functional Linguistics

INTRODUCTION: TACIT KNOWLEDGE AS EFFABLE

Much of human experience is below-view, unattended to as we operate in the world, but integral to our performance as social creatures. The implicit aspect of our practice allows us the experiential agility to be at once efficient and creative, to assimilate the novel and the familiar: in essence, to develop expertise. A challenge for Information Systems practitioners and researchers is to elicit this expertise from people in organisations. Polanyi (1958) suggests that this implicit component of expertise is inherently personal, underlying our ability to perform tasks we find difficult to explain such as facial recognition. Capturing and sharing such knowledge is a consistent problem in Information Systems and Knowledge Management research (Nonaka and Takeuchi, 1995, Wenger, 1998, Boisot, 1995). However, existing knowledge elicitation and requirements analysis methods such as protocol analysis (Ericsson and Simon, 1993) and interviews (Agarwal and Tanniru, 1990) all obtain discourse from participants but do not specify explicit strategies for uncovering knowledge that is implicit. This is because they assimilate the assumption that tacit knowledge cannot be articulated.

The possessors of skilful practice, the artisan, the witchdoctor or the physician, have occupied a position of both importance and mystery in most cultures since ancient times. Our interest over the ages in such hidden knowledge has caused us to mythologise expertise, placing it beyond the common by constructing it as unspeakable. Thus, in contemporary times it is not surprising that the dominant research perspective on the embedded components of expertise maintains that they are unspeakable and cannot be understood by looking at what and how people communicate verbally. This paper seeks to demonstrate the flaw in this view.

As information technologies have begun to alter the way in which we think about our own processes while looking for ways to automate and retain our practices, we have been compelled to consider how the experience of the artisan mentioned above can engage with the constraints of the computational world. Early attempts to negotiate this relation in a field known as Knowledge Acquisition involved the construction of *expert systems* (Byrd et al., 1992). It was intended that these systems apply concrete rules in order to mimic the performance of a human expert. Quickly, however, engineers discovered that significant components of that human performance resisted quantification in rules or maxims as the human subject was not aware of many aspects of what they were doing as an expert. A similar barrier was confronted by organisations seeking to capitalise on the expertise of their employees for competitive advantage. These organisations sought to measure and codify the skill of their employees so that it could be reused by others. In both contexts the participants discovered that there was something that remained below-view. This something which we refer to as *tacit knowledge* is the topic of the present paper.

The attribute most consistently ascribed to tacit knowledge is ineffability (Nonaka and Takeuchi, 1995, Baumard, 1999, Collins, 2001, Reber, 1993). The strong position is that tacit knowledge cannot be articulated in any linguistic form, while the weak position holds that it is difficult to articulate. Polanyi's (1966:4) widely cited suggestion that "we know more than we can tell" asserts the epistemological significance of tacit knowing in terms of its ineffability. In assessing this proposal, it is important to consider what it means 'to tell'. If telling means making explicit codified artifacts that are directly transferred to the mind of the listener, then this kind of telling is not a possible means of exposing tacit knowledge. However, if we allow that telling involves processes of which the speaker is not necessarily aware and which are, in turn, subject to both unconscious and conscious interpretation by the listener, linguistic structure is reinstated as relevant to understanding tacit knowledge.

Thus, it appears that Polanyi's statement needs to be refined. We know more than we can tell only if we think about telling as making explicit knowledge. Such an assumption utilizes an impoverished model of communication. This model, often referred to as a mathematical model of communication, presupposes that meaning in communication is absolute and, as such, may be seamlessly transferred from the mind of the speaker to that of the listener. It applies what Reddy (1979) terms the conduit metaphor, that is, the notion that words are boxes with meanings inside that are unpacked by the person to which they are directed. Reddy (1979:287) argues that the metalingual resources of English privilege this kind of view, as the following examples suggest:

> *Whenever you have a good idea practice capturing it in words*
>
> *You have to put each concept into words very carefully*

Just as in uttering the sentences above we are unlikely to focus on the presuppositions about communication that they presume, when we speak, that which we utter cannot be viewed as an overt object. We may well articulate what we know implicitly through patterns and features of language to which we do not directly attend. This is an argument that articulation does not produce a form that by definition is explicit, or in alternative terms, that articulation is not the equivalent of codification. Acknowledging this idea is a first step in overcoming what Byrd et al (1992:123) term *between obstacles* in communication, that is, the difficulties of interpretation of meaning which people have when they interact. This kind of obstacle is often contributes to misalignments in the perception of systems analysts compared with users, and knowledge engineers compared with experts.

There is a substantial tradition within psychotherapy that has approached language as a way of understanding a person's unconscious experience (Pittenger et al., 1960, Labov and Fanshel, 1977, Freud, 1960, Ferrara, 1988, Lentine, 1988, Ferrara, 1994, Parker, 1995). This notion is further specified in linguistics by Halliday and Webster (2002:303) who assert the significance of the relationship between grammar and the unconscious. Meaning-making with grammar is, according to this view, implicit meaning-making:

> Conscious language achieves its creative force mainly be lexical means; and lexical items are semantically close to experience. Unconscious language depends much more for its creative force on grammar – and grammatical categories are far removed from experience. (Halliday and Webster, 2002:303)

This appears in accord with the argument that description of the grammatical features in a subject's discourse will give us insight into the nature of their unconscious experience. It follows from this, that if the features of a subject's grammar involving meanings that are effaced are explicated, then the knowledge to which they point may be elicited.

AIMS

This research was conducted in the digital media division of a broadcasting organisation in Australia. This organisation had recently undergone restructuring of its content management processes. The digital media division was in the process of migrating an existing content management system to a new system and altering associated work practices. This migration process was an important project in the organisation and involved not only the transfer of content but the transmission of expertise from individuals who understood the existing system to those that were developing the new system. The manager in charge of the redevelopment possessed considerable tacit knowledge relating to both the idiosyncrasies of the existing system and the practices surrounding the communication of such knowledge in the organisation. He was faced with the challenge of transferring this tacit knowledge to the project manager and information systems practitioners working on the second generation system. The aim of this study is to elicit this tacit knowledge from the manager in order to assist him with this project by rendering explicit his implicit processes and assumptions. In doing this, we demonstrate that our methodology produces a change in the language of the manager that conforms to our linguistic model of tacit knowledge. The knowledge that is elicited using this methodology is explained in terms of this model.

Our aims may be summarised as the following:

1. To introduce the notion that tacit knowledge is effable.
2. To explain a linguistic model of tacit knowledge
3. To detail a directed interview methodology to elicit tacit knowledge
4. To demonstrate how the above model and interview methodology can be applied in an organisation to elicit tacit knowledge

Viewing our work in terms of Byrd et al.'s (1992) categorization of requirements analysis and knowledge acquisition techniques into *observation techniques, unstructured elicitation techniques, mapping techniques, formal analysis techniques and structured elicitation techniques,* we propose that our methodology introduces a new technique, that of *directed elicitation.* Directed elicitation means that in the elicitation process, rather than focusing on solely on content, we attend to below-view phenomena embedded in the structure and semantics of the expert's language. It is *directed* in the sense that we use this phenomena as the target site for elaboration of their knowledge. The present case-study focuses on what Byrd et al. (1992) term the problem domain of *process understanding*, that is, how people conceive their actions in the functional context in which they work. The methodology is, however, portable and could be applied to other problem domains, such as requirements analysis, in which it is possible to interview participants.

TACIT KNOWING OR TACIT KNOWLEDGE?

Polanyi's thesis is a 'Theory of Tacit Knowing' (TTK) rather than a theory of tacit 'knowledge'. As such, it theorizes a process rather than an object. This conceptual position is in accord with the movement in semiotics and other disciplines concerned with theorising knowledge, such as philosophy and linguistics, away from reification. That is, away from a constituency-based view of knowledge as an object, toward a view of knowledge as dynamically constructed, as, in effect, 'made'. The position has important implications for modelling tacit knowing and is fundamentally different to existing approaches to modelling 'tacit knowledge'. These existing approaches attempt to taxonomies subsets of tacit knowledge. In contrast we adopt a holistic rather than reductionist stance, arguing that a functional approach is required that considers how tacit knowing as a process operates in its human, situated context.

In attempting to model tacit knowing as a process we adopt the position that knowing is an act of meaning-making in a context: it is the making of a text. Our position holds meaning as an unfolding process rather than an artifact. It should be noted that in using the term *text,* we do not refer to a written document, but rather to the construal of experience. Such experience is construed through semiosis, that is the production of signs. The kind of signs that we deal with in the present thesis are linguistic signs produced by people in spoken discourse. Hence we figure knowing as an activity of meaning-making performed by people in their functional context. The context is functional because it is involved in getting something done.

IMPLICIT MEANING-MAKING IN SPOKEN DISCOURSE

This paper asserts that tacit knowledge is implicit meaning-making, that is, meaning-making to which we do not directly attend. Hasan, Williams et al. (1996) introduce the notion of implicit style in discourse. They give the example of the clause, "they will", which they argue is an example of maximal implicitness as it does not contain a string that is not implicit. The clause raises the questions: who 'will' and what 'will' they? Hasan, Williams et al. (1996:194) argue that we may distinguish between implicit and explicit ways of saying and that, when an implicit style is adopted by a speaker, "precise meanings become available only if certain additional conditions are met; the average working knowledge of the language is necessary but not sufficient". The additional conditions that the present methodology adopts is a theory of language, Systemic Functional Linguistics (SFL), a tool for studying the spoken discourse of participants.

SFL is a theory interested in describing language in terms of its semantic function in the social and cultural contexts within which it is put to use by speakers. In this way it differs from the formal, syntactic approach of traditional grammars. Halliday (1978), a major figure in the development of SFL, describes language as a social semiotic. Butt (2000) provides a clear outline of what this means:

> To say language is social implies that a community of speakers share knowledge about systems of sound and writing, about lexicogrammar, about meanings and about situations. To say that language is semiotic implies it is a system of signs which convey meaning about that culture, just as other sign

> systems such as dress and architecture are shared by a cultural group and constitute that culture. (Butt 2000:10)

Thus, the social semiotic perspective suggests that the relationship between language and meaning is not arbitrary. Due to this, SFL asks questions about how language is used by speakers and writers to make meanings in functional contexts and how is it organised to achieve this. It approaches instances of such meaning-making as 'texts', that is, as units that have semantic significance. Eggins (1994:23) suggests that SFL is distinct amongst linguistic theories as "it seeks to develop both a theory about social process AND an analytical methodology which permits the detailed and systematic description of language patterns". Systematic description is possible in SFL as it is a systemic theory, that is a theory arising out of the linguistic school known as Systemics. As such, SFL figures meaning as the selection of alternatives from a system network of possible choices. Figure 1 provide an example of a system network for process selection, that is, for describing the happening of goings-on in a particular context.

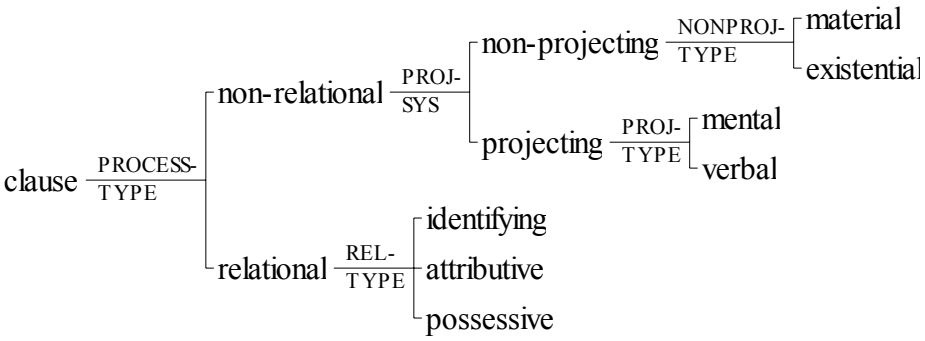

Figure 1 A system network for process selection (Matthiessen 1995)

This paper presents a methodology for eliciting tacit knowledge from subjects through a process of directed interviews. This process centers upon the interviewer identifying semantic and grammatical features in the subject's language that point to knowledge that the participant possesses but which is 'below-view'. The knowledge is below-view in the sense that the linguistic-choice that the participant has made indicates *Under-representation***.** Under-representation occurs when knowledge is rendered below-view in the sense that fundamental components are effaced in discourse as they have been automatised by the individual. For example, the agent in a clause may be omitted (see Type 2 in Table 1). In addition to simply being left out of discourse, the knowledge may be effaced through generalisation to the extent that it is not available for deconstruction. For example, a verb may be nominalised meaning that something that was a process with component steps is rendered as a static object This means that there is less potential for these steps to be analysed (see Type 3 in Table 1). The features in our model of under-representation are presented in Table 1. It should be noted at this point, that we are attempting not merely to elicit a detailed account from the subject in terms of precision, but an account that uncovers meaning that has been obscured through under-representation. Tacit knowledge is unconscious in the sense that we do not attend to such obfuscation.

ACHIEVING A RICH REPRESENTATION OF TACIT KNOWLEDGE: THE NOTION OF DELICACY AND ELABORATION

The methodology proposed in this paper seeks to achieve a rich representation of a subject's tacit knowledge through obtaining a *delicate* and *elaborated* representation of effaced phenomena in their discourse. Systemic Functional Linguistic theory posits delicacy as the ordering scheme by which the system network moves from most general to most specific (Matthiessen, 1995:14-15). As already mentioned, System networks are networks of choices that language users make in order to produce meanings. Elaboration is a process of additional description through exposition ('in other words'), exemplification ('for example') or clarification ('to be precise') (Halliday, 1994:226).

Eliciting knowledge that is tacit has been likened to chasing a moving target: as soon as the target is made explicit, it is no longer tacit. In addition there is always remnant tacit knowledge that has not been exposed. This means we require strategies that attempt to account for such dynamism. The present methodology involves a process aimed at approaching the problem in dialogic terms, iteratively responding to phenomena in a subject's discourse. The methodology entails:

> 1. Identifying the semantic feature that suggests knowledge that is under-represented or abstracted and important for the current knowledge management task. This under-represented or abstracted knowledge is at this point, T1, tacit (see Figure 2)

2. Asking a question that elicits a more delicate response from the interviewee and which prompts them to elaborate on this feature. At this point, T2, the knowledge is made explicit, in the sense that it is articulated, though not in the sense that it is codified (see Figure 3).

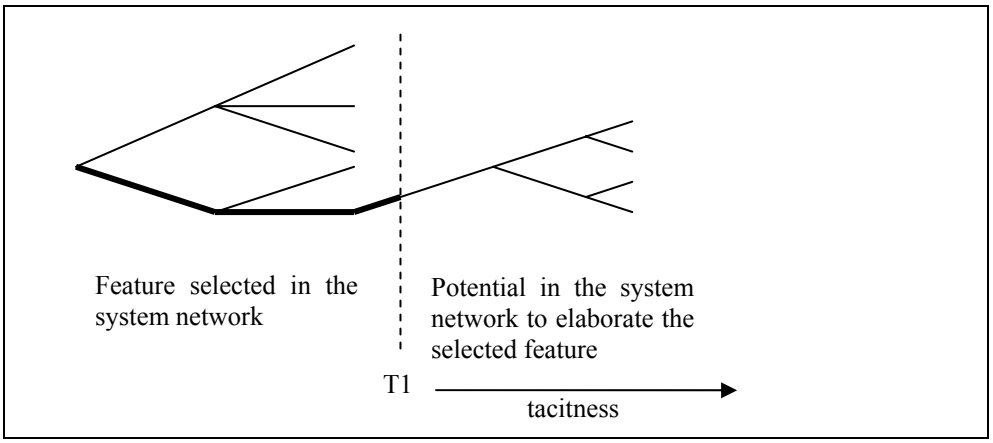

Figure 2 Tacit Knowledge at T1

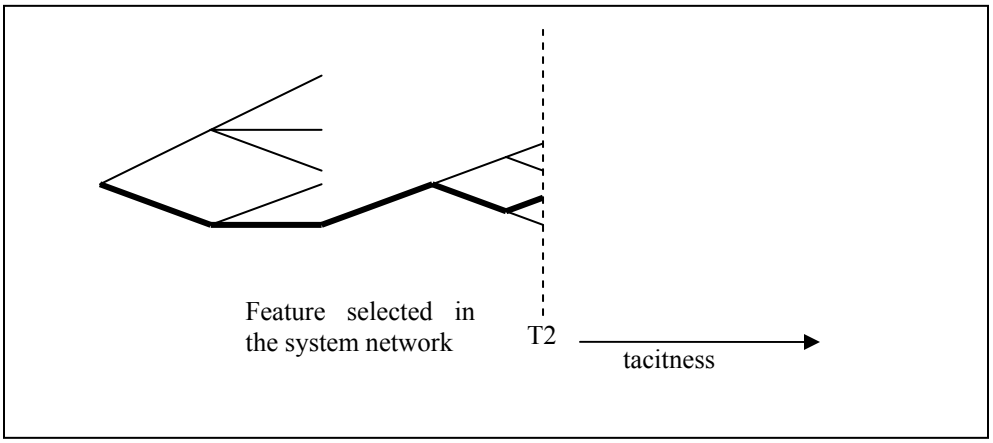

Figure 3 Tacit Knowledge at T2

As Figure 2 indicates, the tacit knowledge at T1 resides in the potential that the subject possesses to achieve further delicacy and elaboration in their representation. They may achieve this delicacy and elaboration through making choices about which aspect of the system network they select, as shown by the bold line. It should be noted that multiple, multi-dimensional system networks are involved, despite the two-dimensional representation. This is because meaning-making involves multiple, complimentary resources that at once may be experiential, textual and interpersonal.

As Figure 3 shows, at T2 the subject has made a selection from the system network by responding to a follow-up question by the interviewer, choosing to take one path (the bold line) and ignoring the others (the thin lines). This question targeted a semantic feature in the subject's discourse that pointed to the existence of hidden meaning. The process is iterative as, at T2, there is further potential for tacit knowledge to be elicited through a question responding to a particular feature in the subject's discourse at that point.

Identifying such features will contribute in eliciting a more delicate description of the subject's meaning than a strategy based solely on eliciting content. The description is more delicate not only in the sense of being more specific lexically, but in the sense of being increasingly precise lexicogrammatically. This is not a structuralist argument that there is one concrete meaning to which the subject is directed. Instead it is an argument that uncovering more of the meaning-making choices that a subject can make, but which they have chosen not to foreground in a particular instance, will give more insight into the

knowledge they possess. For example, consider the clause "The system is being developed". Transitivity analysis on this clause reveals a material process ("being developed") with a goal ("the system") but with the actor omitted. The actor, in this case, would be the entity doing the developing. In addition, the target audience for the system is not given. At this point, the interviewer should ask questions aimed at eliciting the semantic features that have been obscured with a view to uncovering the corresponding hidden knowledge.

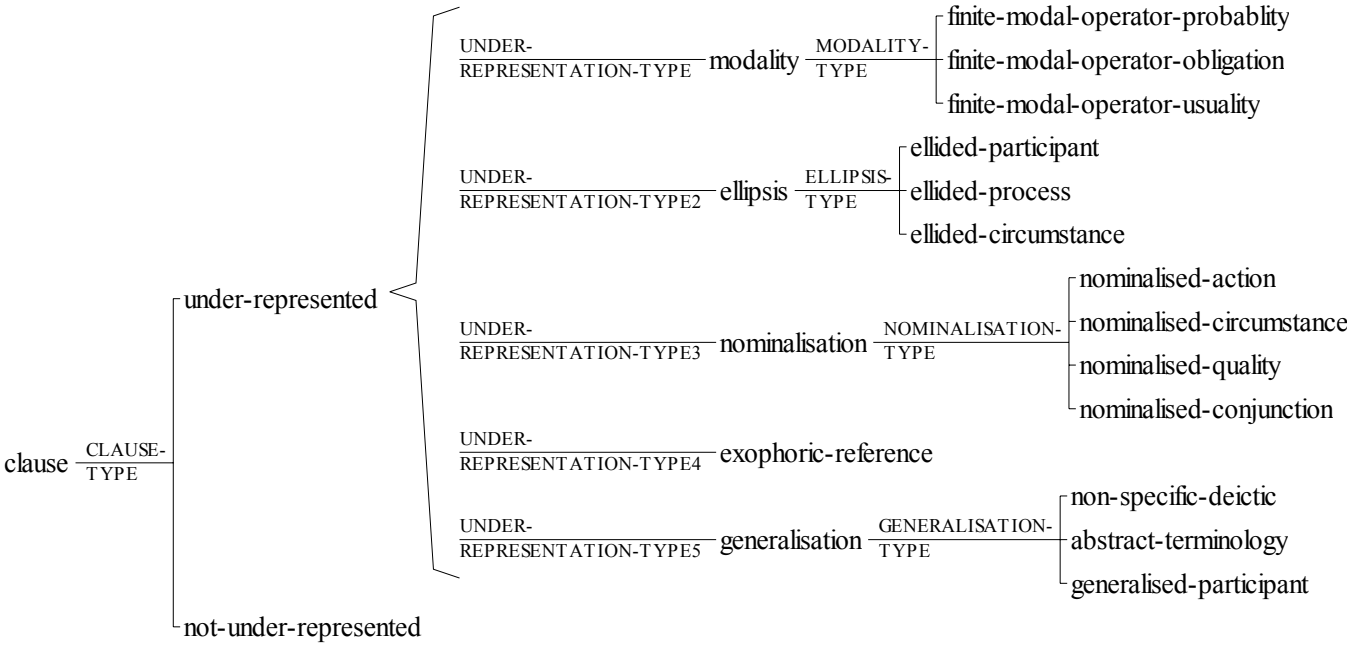

Figure 4 System network for under-representation

METHOD

A one hour interview was conducted with the head of digital media in media and broadcasting organisation, Organisation X. This experiment aimed to determine whether under-representation, features in a linguistic model of tacit knowledge, decrease in a subject's discourse when a directed interview protocol is adopted compared with a structured interview technique. This directed protocol aims to elaborate under-representation when it is identified in a subject's speech. Figure 5 details the experimental hypothesis, H1, relating to language change in the discourse of a subject in the directed interview phase. This hypothesis suggests that the subjects discourse will contain less under-representation than the discourse that they produce in the structured interview phase. The hypothesis will be tested against the null hypothesis, H0, that there is no difference in the subject's language in the directed and structured interview phases.

> H1: The speech of a subject in the directed interview phase displays less under-representation compared to that present in the structured interview phase.
>
> H0: The speech of a subject in the directed interview phase displays the same amount of under-representation as that present in the structured interview phase.

Figure 5 Experimental Hypothesis and Null Hypothesis

The interview was transcribed by the researcher and the two phases, Text 1 and Text 2, were selected for analysis. Text 1 consisted of 60 clauses of the subject's discourse at the beginning of the interview in which he spoke freely with minimal direction by the interviewer. Text 2 consisted of 51 clauses of the subject's discourse from the end of the interview in which the interviewer used the directed interview protocol.

Text 1 and Text 2 were analysed to determine the amount of under-representation that they contained using the schema in Figure 4.This involved tagging each text for the occurrence of the features in each of its clauses using Systemic Coder (O'Donnell, 2002). More than one feature could occur in each clause. Text 1 contained 83 features in total and Text 2 , 52.

Type of Feature	**Feature**	**Example**	**Question**
Type 1: Modality	Finite modal operator of probability	They would review it.	How do you know would review it?
	Finite modal operator of obligation	We should review this process.	Why should we review it?
	Finite modal operator of usuality	They must always review it.	Why will they always review it?
Type 2: Ellipsis	omission of a participant	The policy is under review.	The policy is under review by whom?
	omission of a process	The policy.	What does the policy mean?
	omission of a circumstance	The policy is under review.	How is the policy under review?
Type 3: Nominalisation	action → thing	We use reinforcing management practices.	How do you manage?
	quality → thing	Efficiency is the most important factor.	What does it mean to be efficient?
	circumstance → thing	Organisational change is our destination	How will you change?
	conjunction → thing	The poor uptake of the system is the cause of the projects failure.	How did the poor uptake cause the failure?
Type 4: Reference	exophoric reference	That system. (over there)	Tell me about that specific system.
Type 5: Generalisation	Non-specific deictic	They reviewed some reports	Which reports specifically?
	Abstract terminology	This will aid the cost-benefit ratio.	How does this cost X? How does this benefit X?
	generalised participant	Users prefer computers	Which specific users prefer computers?

Table 1 Summary of features of under-representation and corresponding interview questions

RESULTS AND ANALYSIS

The results of the linguistic analysis of the structured and directed interview phases indicate a statistically significant language change from the structured to the directed phases in terms of the features of under-representation. Figure 6 depicts the results of the linguistic analysis on the system network for under-representation and shows the change in frequency for each feature for Tex1/Text2 respectively. The p values are included for features that changed significantly.

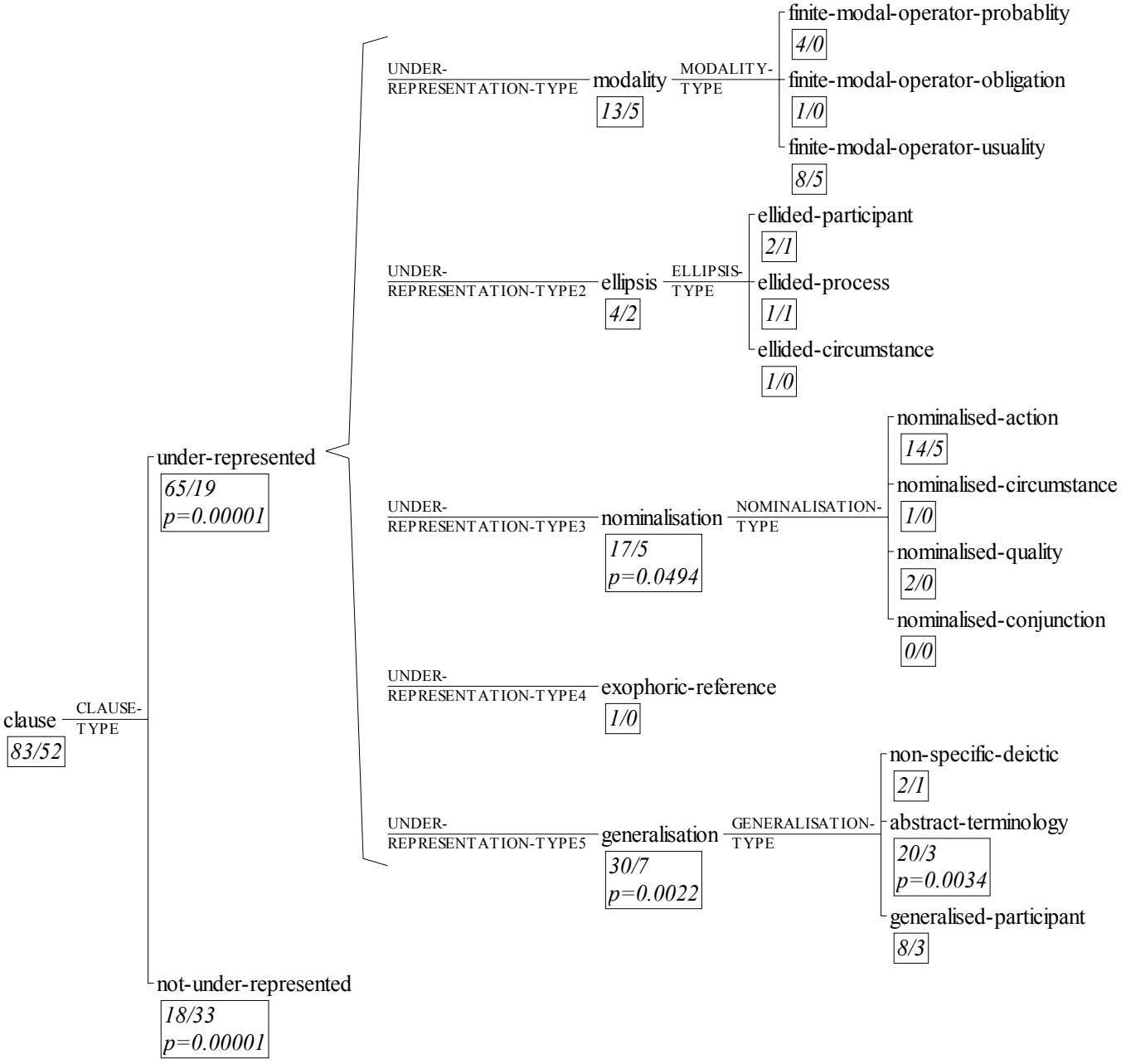

Figure 6 Results of linguistic analysis of Text 1/ Text 2. Number pairs represent the frequencies for structured and direct ed interviews

The significant decrease in under-representation in the directed phase is in accord with the notion that this under-representation has been elaborated by the directed questioning technique. The elaboration contains less under-represented features as they have been 'unpacked'. It should be noted that it is not unexpected that many features did not change in frequency to a significant degree when they are viewed in isolation. This is because language carries meaning in complex and cumulative ways. The language change we seek to describe is holistic in nature, involving the interaction of features in the

under-representation model. The accumulated effect of changes in the frequencies of features at lower levels in the system network produced the statistically significant change at higher levels in the network as the speaker shifted from an implicit to and explicit style.

In elaborating the under-representation of the first phase of the interview the interviewer was able to explicate facets of the manager's tacit knowledge relating to the problem of transferring his personal knowledge about the content management service and related practices to other employees. In the first phase of the interview, the subject's tacit knowledge about such transfer was embedded in nominalizations. For example, he described his division as a "service area" that "provide[s] services including IT services". "Service" is the nominalisation of a range of processes involving understanding, communicating and delivering feedback to clients. An underlying component of these processes is negotiating shared cultural experience. Through elaborating this nominalisation in the directed phase of the interview we uncovered that the manager believed that the greater the shared cultural experience and active cultural processes that he was able to foster, the greater the shared knowledge and cohesion of his employees. This information was not elicited merely by asking the manager to be more specific as this would simply have elicited a more detailed rendering of his explicit style. This may have merely produced a taxonomy of the content management service in the organisation. Instead, we uncovered embedded phenomena about his beliefs and practices as we analysed his implicit style. This phenomena is more 'specific' in a particular way: it is the elaboration of parts of the subject's language of which they were not aware. This is an exercise below the surface of the text, and below the content plane on which most interviews are conducted. As such it involves a richer elicitation of the subject's experience.

CONCLUSION AND FUTURE WORK

This paper has presented a methodology for eliciting tacit knowledge from the spoken language of organisational participants. The methodology involves directed interviews aimed at achieving a delicate representation of the knowledge that is below-view in a subject's discourse due to under-representation. The methodology requires the interviewer to possess expertise in linguistic analysis. This may impede its uptake in organisations who do not typically draw upon this analytical method. However, while linguistic analysis is typically a labour-intensive activity, our method of targeting specific linguistic features in the participant's discourse in real-time means that it is time-efficient.

The study involved a single interview of two phases with a subject. Further research that the present researchers are currently undertaking extends this approach with multiple subjects. We also employ separate structured and directed interviews with independent interviewers. This future work aims to demonstrate the robust and repeatable nature of the directed interview technique. While a language-oriented approach may appear radical given the dominance of Polanyi's concept of knowing more than we can tell, if we acknowledge the role of implicit processes in language production, analysing language appears a viable way of eliciting tacit knowledge. We tell more than we realise we know.

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